

A NEW SPECIES OF *STENELMIS* (COLEOPTERA: ELMIDAE)  
FOUND WEST OF THE MISSISSIPPI RIVER

KURT L. SCHMUDE AND HARLEY P. BROWN

(KLS) Department of Entomology, University of Wisconsin, Madison, Wisconsin 53706;  
(HPB) Department of Zoology, The University of Oklahoma, Norman, Oklahoma 73019.

---

*Abstract.*—Adults of a new Nearctic riffle beetle, *Stenelmis occidentalis*, are described. Its range is restricted to areas west of the Mississippi River where it is one of only a few species in this genus to occur in Mexico, and the only *Stenelmis* known to occur in the northwestern U.S., Montana, Oregon, and Utah. Diagnostically useful characters include size, pronotal sculpturing, elytral color pattern, comparative lengths of the tarsomeres, metatibial spinous ridge on males, and the distinctive male genitalia. Adults are most similar to adults of *Stenelmis decorata*, and differences between the two, and adults of other species, are discussed. Adults occur in several types of lotic situations and they are found on a variety of substrates; they are also readily attracted to lights.

*Key Words:* Elmidae, *Stenelmis occidentalis*, new species, riffle beetle, western United States, Mexico

---

*Stenelmis* Dufour is the most diverse and widespread Nearctic genus of Elmidae (riffle beetles), with 30 described species occurring throughout most of North America north of Mexico (Brown 1983, 1987, White 1982). The senior author is revising the genus in North America, and this paper is part of that study. Adults of the following species are being described at this time to make the name available for a concurrent revisionary study of the riffle beetles of mid-America and the West Indies (Spangler and Santiago, in prep).

This "new" species of *Stenelmis* actually has been known for some time. Texas specimens have been mentioned in the literature as *Stenelmis* sp. (near *decorata*) as early as 1963 by Burke, and by Stewart et al. (1973) and Poole and Stewart (1976) as *Stenelmis mexicana(us)*, one of Brown's manuscript names. In studies on a Montana stream, Gore (1975, 1977, 1978) referred to this species as *Stenelmis* sp. a, and specimens

from Oregon have also been mentioned (Brown 1972). But structural differences between northern and southern individuals, and their similarity to adults of other species, some of which are yet undescribed, prevented the junior author from describing the species separate from a revisionary study.

#### MATERIALS AND METHODS

Extensive collecting was accomplished in the southern range of the species by the junior author, and additional material was examined from the following collections:

- CASC—California Academy of Sciences, San Francisco, D. H. Kavanaugh & R. Brett
- CNCI—Canadian National Collections, Ottawa, Ontario, L. LeSage
- INHS—Illinois Natural History Survey, Urbana, K. C. McGiffen
- MCZC—Museum of Comparative Zoology, Harvard University, Cambridge, Massachusetts, S. R. Shaw, D. Furth, S. Pratt

LSUC—Louisiana State University, Baton Rouge, C. B. Barr, J. B. Chapin  
 NMNH—National Museum of Natural History, Smithsonian Institution, Washington, D.C., P. J. Spangler  
 ODAC—Oregon Department of Agriculture, Salem, R. L. Westcott  
 PERC—Purdue University, West Lafayette, Indiana, A. Provonsha  
 TAMU—Texas A&M University, College Station, H. R. Burke, E. G. Riley  
 UGAM—University of Georgia Museum of Natural History, Athens, C. L. Smith  
 UMRM—University of Missouri, Columbia, R. L. Blinn, K. B. Simpson  
 USUC—Utah State University, Logan, W. J. Hanson  
 WSUC—Washington State University, Pullman, R. S. Zack  
 CBB—Cheryl B. Barr, Sacramento, California  
 HPB—Harley P. Brown, Oklahoma Museum of Natural History, Norman  
 JRD—Jack R. Davis, Texas Water Commission, Austin  
 DLG—Daniel L. Gustafson, Montana State University, Bozeman  
 EGR—Edward G. Riley, Texas A&M University, College Station  
 KLS—Kurt L. Schmude, University of Wisconsin, Madison  
 WDS—William D. Shepard, California State University, Sacramento

A Hitachi S-570 scanning electron microscope was used at 5 kV or 10 kV to obtain the SEM photographs. Drawings of the genitalia were made using a Prado Universal (Leitz Wetzlar) microprojector. All measurements were made at 72 $\times$  magnification with an ocular micrometer on a Leitz Wetzlar dissecting microscope. Abbreviations and explanations of measurements used in the text and Table 1 are listed below:

IOW—minimum interocular width;  
 PL—maximum length of pronotum measured along mesal plane;  
 PW—maximum width of pronotum;

PW/PL—ratio of pronotal width vs length;  
 EL—maximum length of elytra measured from anterior margin to apex along elytral suture with beetle's venter situated in horizontal plane;  
 EW—maximum width of elytra;  
 EL/EW—ratio of elytral length vs width;  
 PE length—length of pronotum and elytra, measured separately, and summed.

### *Stenelmis occidentalis*

#### Schmude and Brown, NEW SPECIES

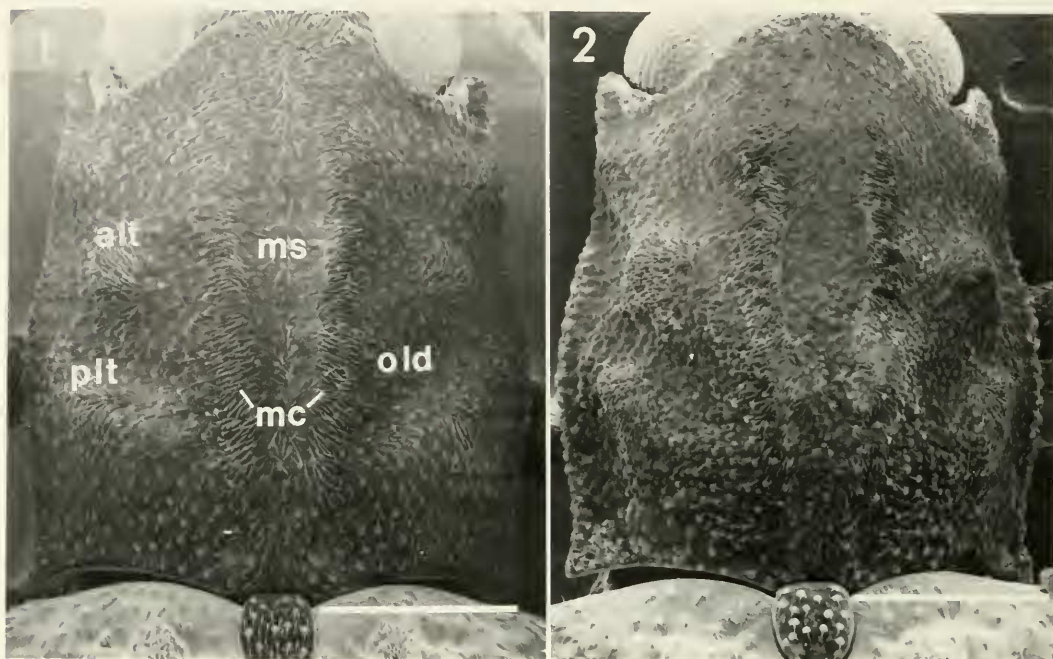
*Stenelmis* sp. (near *decorata*) Burke, 1963: 113.  
*Stenelmis* sp. a Gore, 1975: 215, 1977: 115, 1978: 147.  
*Stenelmis mexicana* Stewart et al., 1973: 960 [*nomen nudum*].  
*Stenelmis mexicanus* Poole and Stewart, 1976: 154 [*nomen nudum*].

Holotype male.—*Head*: IOW: 0.38 mm. Median dark band between eyes narrowed posteriorly; each light band equal in width to dark band at point between eyes. Antennae and palpi testaceous. Antennal and pronotal lengths equal.

*Pronotum* (Figs. 1, 2): PL: 1.00 mm, PW: 0.91 mm. Widest just behind middle; sides narrowed toward base with a slight sinuation before base; abruptly narrowed before middle, then subparallel to apex. Median sulcus deep, widest and deepest anteriorly, gradually narrowed toward base. Median costae prominent, progressively narrowed and elevated toward base. Sulcus and costae obsolete in anterior 0.25 and before basal margin. Lateral tuberculi prominent, clearly separated by shallow, oblique lateral depression. Anterior tubercle round; posterior tubercle more elongate, weakly costate, and obsolete well before basal margin. Granules densely but uniformly distributed over dorsal surface, except less dense in median sulcus; granules of two or more sizes, smallest granules less than one-half the size of largest. Color grey; costae, median sulcus, and basal half lighter than apical half.

Table 1. Variation of six mensural characters and their ratios for adults of *Stenelmis occidentalis* throughout its range. M = male, F = female; definitions for other abbreviations found in Methods section.

Locality	n	PL	PW	PW/PL	EL	EW	EL/EW	PE Length	IOW
TX, type series	M 15	0.95-1.05	0.84-0.94	0.84-0.91	2.18-2.41	1.15-1.29	1.83-1.91	3.14-3.46	0.35-0.39
	F 20	0.98-1.09	0.88-0.99	0.85-0.93	2.24-2.53	1.16-1.31	1.86-1.96	3.23-3.64	0.36-0.43
LA, TX pooled	M 35	0.81-1.08	0.71-0.95	0.83-0.93	1.88-2.50	0.99-1.33	1.80-1.95	2.69-3.56	0.30-0.41
	F 31	0.90-1.15	0.78-1.05	0.84-0.92	2.04-2.65	1.06-1.43	1.80-1.99	2.99-3.79	0.33-0.44
Mexico pooled	M 23	0.89-1.00	0.76-0.86	0.84-0.90	2.09-2.33	1.10-1.25	1.85-1.95	2.99-3.33	0.34-0.38
	F 17	0.95-1.08	0.80-0.86	0.82-0.90	2.14-2.36	1.14-1.26	1.84-1.98	3.10-3.34	0.34-0.40
AR, OK pooled	M 20	0.91-1.08	0.80-0.99	0.86-0.92	2.08-2.53	1.10-1.33	1.83-1.95	3.00-3.60	0.33-0.41
	F 22	0.90-1.09	0.79-0.98	0.86-0.91	2.08-2.50	1.10-1.28	1.86-1.97	2.98-3.56	0.33-0.41
AZ, NV pooled	M 22	1.01-1.19	0.90-1.04	0.83-0.90	2.18-2.63	1.13-1.40	1.84-1.97	3.19-3.81	0.38-0.45
	F 16	1.01-1.20	0.90-1.04	0.84-0.90	2.18-2.64	1.14-1.38	1.89-1.98	3.19-3.84	0.39-0.44
CO, OR, UT pooled	M 22	1.00-1.19	0.86-1.04	0.84-0.89	2.29-2.71	1.16-1.48	1.84-2.01	3.29-3.90	0.36-0.44
	F 17	1.00-1.25	0.84-1.11	0.84-0.93	2.24-2.91	1.11-1.50	1.89-2.01	3.24-4.16	0.38-0.46
MT pooled	M 32	1.06-1.18	0.91-1.08	0.85-0.93	2.48-2.78	1.29-1.44	1.81-1.96	3.56-3.91	0.39-0.45
	F 32	1.03-1.20	0.95-1.06	0.85-0.93	2.55-2.81	1.28-1.45	1.87-2.00	3.58-3.99	0.40-0.45
NE, SD pooled	M 11	1.10-1.24	0.95-1.08	0.83-0.93	2.51-2.93	1.29-1.53	1.83-2.00	3.63-4.16	0.40-0.48
	F 8	1.15-1.21	0.99-1.09	0.86-0.90	2.65-2.88	1.33-1.51	1.90-2.03	3.83-4.09	0.44-0.48



Figs. 1, 2. *Stenelmis occidentalis* pronota; scale lines 0.5 mm. 1, alt—anterior lateral tubercle; plt—posterior lateral tubercle; mc—median costae; ms—median sulcus; old—oblique lateral depression; Texas specimen. 2, Montana specimen.

**Scutellum:** Sixteen granules that are slightly larger than those on pronotum scattered over surface; smaller granules present also.

**Elytra** (Fig. 3): EL: 2.30 mm, EW: 1.24 mm. Base of interval 3 moderately costate for 0.20 elytral length; more costate anteriorly but obsolete before basal margin. Background color brown; each elytron faintly vittate. Medial portion of vitta diffuses with background color; anterior and posterior portions brighter. Vitta does not overlap humeral angle; confined anteriorly between striae 4–5; medially expanded to include portion of interval 4; includes stria 3 posteriorly; ends beyond lateral carina but before apical margin. Interval 1, and much of posterior portion on outside of lateral carina, also lighter than background color.

**Venter:** Apical emargination of last sternum wide and deep, but narrower than apical width of 5th metatarsomere.

**Legs** (Figs. 4, 5): Each femur with nu-

merous granules of different sizes scattered over surface. Femur and most of each tibia same color as pronotum; apex of tibia and each tarsus testaceous. In dorsal view, basal half of each 5th tarsomere narrow with sides subparallel, next quarter length dilated, apical quarter length subparallel. Fifth tarsomere of pro- and mesotarsi slightly longer (0.03 mm) than their preceding four tarsomeres combined; 5th metatarsomere equal in length to its four preceding tarsomeres. Apicoventral margin of 5th tarsomere slightly convex. Conspicuous spinous ridge on distal half of inner margin on mesotibia. Distal half of metatibia with a weak spinous ridge on inner margin.

**Genitalia** (Figs. 6, 7): Penis widest at base, constricted toward middle where it becomes swollen, then subparallel to its rounded apex. Each paramere with basodorsal portion wide, elongate, nearly truncate distally, and longer than apicodorsal portion; inner dorsal margin slightly divergent distally, and

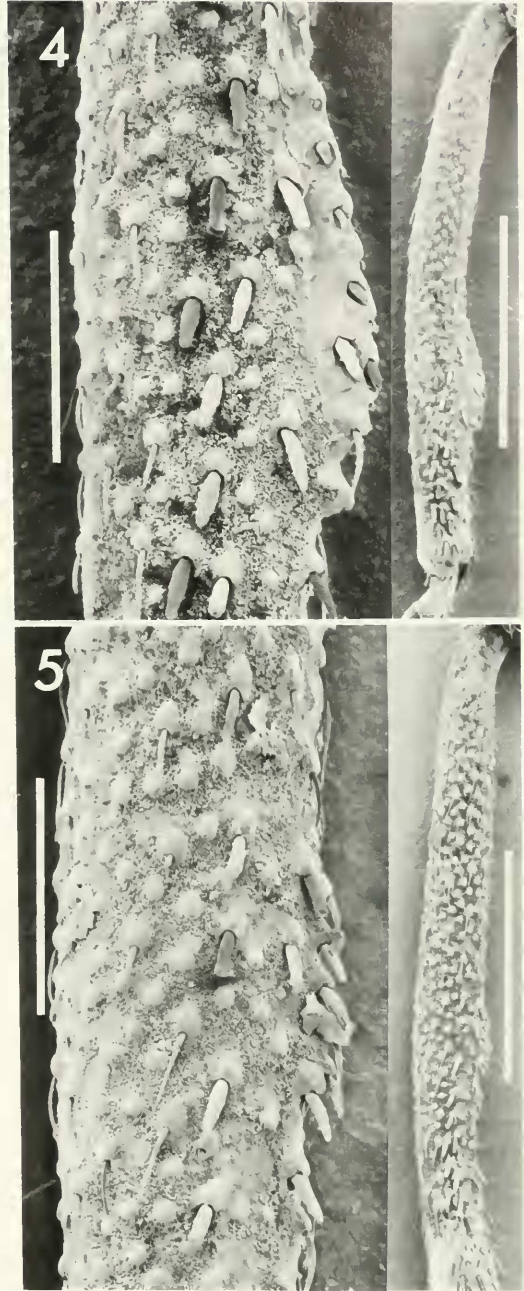


Fig. 3. *Stenelmis occidentalis* elytra; scale line 0.5 mm; c—costae on third intervals; Montana specimen.

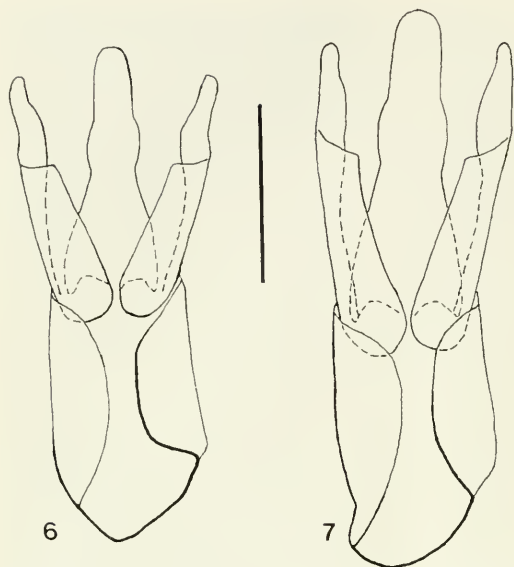
abruptly angled toward outer margin at apex; outer margin subparallel basally and convergent apically with a shallow sinuation before apex; inner ventral margin slightly sinuate apically, then broadly concave to base.

**Allotype.**—IOW: 0.39 mm, PL: 1.05 mm, PW: 0.91 mm, EL: 2.40 mm, EW: 1.25 mm. Essentially similar, but larger. Sides of pronotum more sinuate at base, more convergent at apex. Color of interval 1 on elytra not noticeably lighter than background color. Fifth tarsomere of pro- and mesotarsi slightly longer (0.04 mm) than preceding four tarsomeres combined. Without sexual characters (spinous ridge) on meso- and metatibiae.

**Variations.**—Variation within the type series is minimal. The antennae can be slightly shorter than the pronotum. Some specimens are essentially and faintly bi-



Figs. 4, 5. *Stenelmis occidentalis* meso- and metatibiae of male; scale lines 0.1 mm, insert scale lines 0.5 mm; Montana specimen. 4, mesotibia with conspicuous spinous ridge on inner margin. 5, metatibia with weak spinous ridge on inner margin.



Figs. 6, 7. *Stenelmis occidentalis* male genitalia; dorsal; parameres spread wider than natural; scale line 0.25 mm. 6, Mexico specimen. 7, Montana specimen.

maculate, with narrow anterior and posterior maculae confined to interval 5, and interval 3 to stria 5, respectively. The meso- and metatibial spinous ridges on males can be slightly less or more conspicuous.

Variation of specimens from the southeastern portion of the range is similar to that found within the type series. Pronotal and elytral sculpturing can be less pronounced. As few as nine large granules occur on the scutellar surface. Elytral color pattern varies from nearly immaculate, narrowly (interval 5) to broadly (interval 4 to stria 5) maculate or vittate. Background color of elytra is light to dark brown to black; diffusion of the testaceous markings with the light brown background color is common. In males, the 5th tarsomere of the pro- and mesotarsi can be even longer (0.04–0.06 mm) than the preceding four tarsomeres combined. In both sexes, the 5th metatarsomere can vary from being 0.03 mm shorter to 0.03 mm longer than the preceding four tarsomeres combined. The weak metatibial spinous ridge on males is inconspicuous to distinct. Male genitalia vary slightly in size and the medial

swelling of the penis is reduced and not distinctly evident in some.

In general, northern specimens are larger. We found a male and female from South Dakota and a female from Utah with PE lengths more than four millimeters; these are the largest *Stenelmis* recorded from North America. In northern specimens the antennae are distinctly shorter than the comparatively longer pronotum. The anterolateral pronotal margin can be sinuate. The pronotal and elytral sculpturing are more pronounced. Up to 27 large granules occur on the scutellar surface. The elytra are maculate to vittate and the testaceous markings are usually wider and cover as much as a part of interval 3 to stria 5 anteriorly, and striae 2–5 posteriorly. When vittate, the medial portion varies considerably in width, from narrow (striae 4–5) to wide (interval 3 to stria 5), and it is usually fainter than other portions, while it nearly diffuses with the background color in some beetles. Posterior area on the outside of the lateral carina can also be lighter than the background color. Lengths of the 5th tarsomere on the pro- and mesotarsi of females are 0.03–0.06 mm longer than the preceding four tarsomeres combined, but are equal to 0.05 mm longer in males. The 5th metatarsomere is 0.01 mm shorter to 0.01 mm longer in females, and 0.04 mm shorter to equal in males. The metatibial spinous ridge on males, although low, is distinct on most individuals. Besides being larger, the penis of most individuals is even more swollen medially, and the outer dorsal margin of the parameres can be more deeply sinuate before its apex.

**Diagnosis.**—This species cannot be inserted into the adult keys of Sanderson (1938) or Brown (1972) because the distinguishing characters are not in accordance with the key's structure. Rearranging the keys to accommodate adults of *S. occidentalis* would not be prudent at this time because several new, undescribed species must also be included, and a reorganization of the

key based, in part, on different characters is required. Instead of providing a key, we distinguish adults of *S. occidentalis* from adults of similar species in the discussion below.

Although individuals in its northern range make this species the largest *Stenelmis* in North America, some specimens from southern Texas are relatively small and could easily be confused with specimens of other species. Adults of *S. occidentalis* are most similar to those of *S. decorata* Sanderson and *S. n. sp.* (identified as *S. bicarinata* in Barr and Chapin 1988), but can be separated by comparing measurements and ratios of the head, pronotum, and elytra as listed in Table 1. In addition, the more pronounced pronotal sculpturing, the elongate but not distinctly costate basolateral tubercle, and the dense but uniform pronotal granulation, with different-sized granules, are distinctive characters. The elytral markings of most specimens do not contrast as sharply with the background color as they do in individuals of most species. The combination of the 5th tarsomere on the pro- and mesotarsi most commonly being longer than their preceding four tarsomeres, while it is shorter or subequal on the metatarsi, along with the large mesotibial spinous ridge and smaller metatibial ridge in males, is diagnostic. The male genitalia, without a lateral flange on the penis, is very similar to the genitalia of most species in Sanderson's (1938) *crenata* group, but especially to *S. decorata* in his *sinuata/humerosa* group. The constricted and then swollen medial area on the penis is unique, and when combined with its rounded apex and the characteristics of the parameres, males are easily identified.

**Type data.**—*Holotype, allotype, 33 paratypes:* TEXAS: *Bastrop Co.*, Bastrop State Park, 24 June 1963, at light, S. G. Wellso. Holotype and allotype are on permanent loan to the NMNH from TAMU. Paratypes will be deposited in the following collections: 15 TAMU, 4 NMNH, 4 CASC, 2 CNCI, 2 INHS, 2 Snow Entomological Mu-

seum, University of Kansas, 2 Instituto de Biología, Universidad Nacional Autónoma de México, México, D.F., 2 HPB.

**Additional specimens examined.**—An additional 2626 specimens were examined. Following each collection record, the numbers of individuals are in parentheses and immediately precede depository institutions or private collections, which are abbreviated as in Methods section. **Arkansas.** *Scott Co.* Mill Cr., 5 mi E Y City, 9 Jul 1965, J. L. Donahue (1 KLS). *Washington Co.* 24 Jul 1940 (1 INHS). **Arizona.** Yuma, HornColl H3951 (1 MCZC). Yuma, HornColl H (1 MCZC). **Colorado.** *Mesa Co.* Cameo Power Plant, 8 Jul 1977, A. A. Borksi (2 UMRM; 1 KLS). **Louisiana.** *Grant Par.* Stuart Lk. Rec. Area, 22–29 Jul 1982, light trap, EGR (2 LSUC). **Montana.** Tongue R., 21 Sep 1978, R. Oswald (26 HPB). *Bighorn Co.* Busby, Rosebud Cr., 29 Aug 1989, DLG (34 DLG; 16 KLS). *Carter Co.* Alzada, Little Missouri R., 30 Aug 1989, DLG (1 KLS). *Chouteau Co.* Ft. Benton, Missouri R., R. Oswald, summer 1978 (2 HPB). *Golden Valley Co.* Ryegate, Musselshell R., 1 Sep 1989, DLG (18 DLG; 15 KLS). *Musselshell Co.* Melstone, Musselshell R., 1 Sep 1989, DLG (2 KLS). *Rosebud Co.* Ashland, Tongue R., 30 Aug 1989, DLG (19 DLG; 13 KLS). Birney, Tongue R., 1975, J. A. Gore (7 KLS). Mouth of Rosebud Cr., 31 Aug 1989, DLG (43 DLG; 28 KLS). Rosebud Cr., 10 Jun 1976, S. Baril (51 HPB). **Nebraska.** *Dawes Co.* White R., 8 mi NE Chadron, 17 Jun 1984, W. P. McCafferty, A. V. Provonsha (6 PERC; 6 KLS). **Nevada.** *Clark Co.* Moapa, Muddy R., 12 Dec 1986, WDS (2 KLS; 4 WDS), Muddy R. & Warm Springs outflow stream, 6.5 mi NW Moapa, 12 Dec 1986, CBB (2 CBB). *Lincoln Co.* Ash Springs outflow streams, U.S. Hwy 93, 12 Dec 1986, CBB (7 LSUC; 16 CBB; 9 KLS; 10 WDS). **Oklahoma.** *Caddo Co.* Anadarko, Washita R., 20 Jul 1963, HPB (7 HPB). Verden, Washita R., 31 May 1971, HPB (45 HPB). *Cleveland Co.* Norman, 25 Aug 1975, 3 Jun–13 Aug 1976, light trap,

WDS (3 WDS). *Comanche Co.* East Cache Cr., 1 Jul 1963, HPB (36 HPB). *Custer Co.* Washita R., 2 mi W Clinton, 5 Nov 1977, WDS (5 WDS), 8 mi E Cordell, 5 Nov 1977, WDS (6 WDS). *Garvin Co.* Washita R. N Wynnewood, 1 Sep 1967, HPB (21 HPB). *Grady Co.* Washita R., 6 Oct 1963, HPB (1 HPB). *Johnston Co.* Tishomingo, Pennington Cr., 25 Jul 1972, HPB (1 HPB). *Latimer Co.* 5 mi W Red Oak, 2 Jul 1977, K. Stephan (1 HPB). *Love Co.* Mud Cr., 5 Jul 1963, HPB (1 HPB). *Major Co.* creek W Cleo Springs, 1800 ft elev., 5 Sep 1971, HPB (10 HPB). *McClain Co.* S. Canadian R., Newcastle, 18 Aug 1976, WDS (2 WDS). *McCurtain Co.* Glover R., 25 Jul 1972, HPB (1 HPB). *Stephens Co.* Wild Horse Cr., 26 Jul 1962, HPB (34 HPB). *Washita Co.* Cordell, 4 Jul 1969, HPB (30 HPB). **Oregon.** *Malheur Co.* Ontario, Exp. Sta., 2 Aug 1960, light trap, F. P. Larson (2 ODAC; 2 HPB). **South Dakota.** *Fall River Co.* Cheyenne R., U.S. Hwy 38, 11 Jun 1975, W. P. McCafferty, A. V. Provonsha, B. L. Heath (4 PERC; 3 KLS). **Texas.** *Anderson Co.* 10 mi SW Elkhart, 23 Jul 1960, light trap, H. R. Burke (3 TAMU). Salmon, 27 Jun 1975, light trap, H. R. Burke (4 TAMU). Trinity R., U.S. Hwy 287 nr Cayuga, 6 Oct 1987, JRD (2 JRD). *Bastrop Co.* Bastrop St. Pk., 24 Apr 1962, light trap, S. G. Wellso (10 CASC; 10 TAMU; 6 INHS), 13 Jun 1969, S. Peck (5 INHS). *Bee Co.* Aransas R. E Papalote, 29 Apr 1982, JRD (3 JRD; 2 KLS). *Bexar Co.* San Antonio, 2 Jun 1958, J. F. Lawrence (1 HPB; 2 MCZC), 4 Jun 1975, M. Druckenbrod (3 NMNH). *Blanco Co.* Johnson City, 5 Oct 1966, HPB (2 HPB). Johnson City, Pedernales R., 27 Aug 1967, HPB (9 HPB). *Bosque Co.* 1 mi N Clifton, 6 Jul 1967, 19 Aug 1970 (13 TAMU). 2 mi W Iredell, 1 Jul 1966 (2 TAMU). Morgan, Steele Cr., 23 Dec 1974, 30 Dec 1976, WDS (4 WDS). *Brazos Co.* Bryan, 16–21 Jul 1965, 28 May–12 Jul 1966, light trap, J. C. Schaffner (17 TAMU), 25 Jun–8 Aug 1988, EGR (7 TAMU; 4 EGR). Cedar Cr., Oct 1971, R. G. Phelps (1 TAMU). College Station, 10 May 1964, H. R. Burke (1 TAMU), 5–10 Aug 1968, 1 Jun 1970, V. V. Board (30 TAMU), 1966, M. H. Sweet (4 TAMU), 21 Aug 1972, light trap, W. E. Clark (1 TAMU), 17 Jun 1989, EGR (4 TAMU). Little Brazos R., Hwy 21, 3 Jul 1970, V. Board & R. Phelps (18 TAMU). *Caldwell Co.* Plum Cr., U.S. Hwy 183, 11 Sep 1987, CBB (3 LSUC; 4 CBB). *Coke Co.* NE Bronte, 29 May 1969, HPB (25 HPB). *Colorado Co.* Columbus (29 NMNH). *Coleman Co.* Coleman, 29 May 1969, HPB (1 HPB). *Comal Co.* Guadalupe R., 1.8 mi E Spring Branch, Rte 33, 16 Dec 1989, R. S. Zack (15 WSUC). Guadalupe R. St. Pk., 11 Sep 1987, light trap, CBB (3 LSUC; 13 CBB; 1 KLS). Wimberly, Blanco R. 25 May 1969, HPB (1 HPB). *Comanche Co.* De Leon, Sabanna R., 29 May 1969, HPB (8 HPB). *Concho Co.* Concho R. S Lowake, 23 Jul 1982, JRD (8 JRD; 4 KLS). *Cooke Co.* Gainesville, Elm Fk. Trinity R., 21 Jun 1978, WDS (1 WDS). *Coryell Co.* Gatesville, 20 Aug 1970, HPB (8 HPB). *Crosby Co.* Crosbyton, 22 Apr 1972, HPB (1 HPB). *Denton Co.* Argyle, Denton Cr., 28 Apr 1939, J. A. & H. H. Ross (8 INHS). Denton Cr., 12 mi S Denton, 21 Jun 1978 (3 WDS). 3 mi S Denton, U.S. Hwy 35, 22 Jul 1975 (12 WDS). Elm Fk., 15 Nov 1970, D. McNeely (7 WDS). *DeWitt Co.* Coletto Cr. nr Weser, 28 Mar 1974, HPB (29 HPB). NE Westhoff, 28 Mar 1974, HPB (77 HPB). Brook S Westhoff, 28 Mar 1974, HPB (9 HPB). *Duval Co.* Sepulveda Ranch, 4 Jul 1970, C. W. Griffen (1 NMNH). *Ellis Co.* Waxahachie, 31 Aug 1967, HPB (7 HPB). *Fort Bend Co.* Missouri City, 31 May 1977, light trap, EGR & LeDoux (8 EGR; 2 KLS). *Frio Co.* Pearsall, 26 Jun 1970, J. W. Smith (1 TAMU). *Gillespie Co.* Pedernales R., 4 mi S Fredericksburg, 23 Jun 1978, WDS (4 WDS). *Goliad Co.* Goliad, San Antonio R., 23 Jul 1962, H. R. Burke (1 TAMU). Small creek E Goliad, 29 Mar 1974, HPB (2 HPB). *Gonzales Co.* Gonzales, Guadalupe R., 28 Mar 1974, HPB (57 HPB). Palmetto St. Pk., 7 Jun 1969, Board & Hafernik (61 TAMU), 14 Jun 1969, M. W. Sanderson (125 INHS),



- 30 May 1977, light trap, EGR (6 LSUC; 20 NMNH; 50 UMRM; 39 HPB; 11 EGR; 25 KLS), 30 May 1983, 27 Apr 1988, CBB (3 LSUC; 5 CBB), San Marcos R., 31 May 1983, CBB (2 CBB). *Grimes Co.* Navasota, Navasota R., 31 Aug 1967, HPB (9 HPB). Navasota R., Hwy 158, 15 Aug 1962, Reeves & Burke (1 TAMU). *Guadalupe Co.* Shertz, 25 Jun 1985, light trap, D. W. Sundberg (2 LSUC; 12 CBB). *Hamilton Co.* Hico, N. Bosque R., 22 Jun 1978, WDS (45 WDS). Leon R., 6 mi N Hamilton, 22 Jun 1978, WDS (133 WDS). *Harris Co.* Houston, Buffalo Bayou, 16 Jul 1985, JRD (6 JRD; 2 KLS). Seabrook, 19 Aug 1970, light trap, WDS (1 WDS). *Hays Co.* Buda, Onion Cr., 17 Sep 1960, H. Chambers (8 TAMU). San Marcos, San Marcos R., 30 Sep 1964, 9 Aug 1969, HPB (4 HPB). San Marcos R. 12 Jul 1967, light trap, G. S. Tulloch (1 TAMU), 27 Aug 1974, J. Kolb (2 NMNH). *Hidalgo Co.* Bentsen-Rio Grande St. Pk., 18 Jun 1969, Board & Hafernik (1 TAMU), 9–10 Jun 1975, light trap, R. Turnbow (6 HPB; 8 UGAM), 17–18 May 1979, 4 Oct 1986, 15–16 Oct 1988, EGR (2 NMNH; 3 TAMU; 2 EGR). Santa Ana Nat. Wldf. Ref., 23 Oct 1987 (2 EGR). *Hill Co.* Blum, Nolan Cr., 23 Dec 1974, WDS (1 WDS). *Kaufman Co.* Trinity R., Hwy 34 nr Rosser, 26 Aug 1987, 12 Oct 1988, JRD (20 JRD; 7 KLS). *Kendall Co.* Boerne, Cascade Caverns, 20 Jul 1981, W. E. Steiner (2 NMNH). Mission, 17 Jul 1981, light trap, W. E. Steiner (5 NMNH). *Lavaca Co.* Navidad R., 10 & 12 mi N Hallettsville, 23 Apr 1961, 28 Jul 1961, H. R. Burke (2 TAMU). *Limestone Co.* Groesbeck, Navasota R., 18 Oct 1969, HPB (2 HPB). *Live Oak Co.* 12 mi N Mathis, 7 Aug 1971, light trap, W. H. Tyson (1 NMNH). Whitsett, Atascosa R., 25 Aug 1962, J. Hafernik (1 TAMU). *Llano Co.* Castell, Llano R., 1 Oct 1960, H. R. Burke (2 TAMU). *McCulloch Co.* San Saba R., 16 mi S Brady, 13 Jun 1963, D. C. & K. A. Rentz (363 CASC; 26 KLS). *McLennan Co.* Bosque R. nr Waco, 14 May 1961, B. McDaniel (2 TAMU). *Medina Co.* Hondo, Hondo Cr., 25 May 1969, HPB (4 HPB). *Menard Co.* Menard, May 1946, L. J. Bottimer (6 CNCI). *Montgomery Co.* Conroe, W. Fk. San Jacinto R., 25 Jun 1967, HPB (2 HPB). The Woodlands, 1–10 Jul 1978, R. Turnbow (2 UGAM), 24–30 Jun 1979, J. E. Wappes (1 TAMU). *Nacogdoches Co.* Douglas, Angelina R., 10 Aug 1969, HPB (1 HPB). *Nolan Co.* Sweetwater, 10 Jul 1937 (1 TAMU). *Nueces Co.* Corpus Christi, 26 Jun, 1 Jul 1970, light trap, C. W. Griffen (6 TAMU). *Palo Pinto Co.* Brazos R., Hwy 4, 30 May 1973, B. Stark (2 HPB), 29 Jul 1982, WDS (3 WDS), 4 mi W Mineral Wells, 27 Jun 1978, WDS (63 WDS). Dark Valley, 29 Jul 1970, D. McNeely (2 WDS). 4–5 mi SW Graford, 25 Aug 1981, WDS (53 WDS; 15 KLS). *Parker Co.* Dennis, Brazos R., 24–25 Jun 1989, EGR (1 TAMU). *Robertson Co.* Camp Cr., 10 Jun 1962, light trap, V. House (1 TAMU). *Runnels Co.* Ballinger, Colorado R. Rte 83, 19 Dec 1989, R. S. Zack (5 WSUC). *San Patricio Co.* 6 mi W Edroy, 1 Jul 1970, C. W. Griffen (4 TAMU). Lake Corpus Christi St. Pk., 9 Jun 1969, Board & Hafernik (5 TAMU). *San Saba Co.* San Saba R., 5 mi W San Saba, 22 Jun 1978, WDS (2 WDS). *Somervell Co.* Glen Rose, Paluxy R., 23 Dec 1974, WDS (8 WDS). *Tarrant Co.* Benbrook, Trinity R., 27 May 1971, 13 Jun 1974, WDS (50 WDS). 5 mi S Benbrook, 21 Jun 1978, WDS (7 WDS). *Tom Green Co.* Concho R., 14 mi E San Angelo, 12 Jun 1961, H. R. Burke (2 TAMU). *Travis Co.* Austin, Onion Cr., 19 Aug 1970, 4 Jul 1978, HPB (5 HPB). *Victoria Co.* Raisin, Coletto Cr., 29 Mar 1974, HPB (5 HPB). sandy creek W Inez, 29 Mar 1974, HPB (12 HPB). San Antonio R., 16 mi S Victoria, 20 Aug 1962, H. R. Burke (4 TAMU). Victoria, 26 Jun 1965, P. J. Spangler (3 NMNH). *Washington Co.* Washington-on-the-Brazos St. Pk., 12 Jun 1969, M. W. Sanderson (21 INHS). *Wharton Co.* Wharton, 19 Aug 1970, light trap, WDS (1 WDS). *Williamson Co.* San Gabriel R., 6 mi E Georgetown, 1 Oct 1960, H. R. Burke (5 TAMU), Taylor, 16 Jun 1967, J.

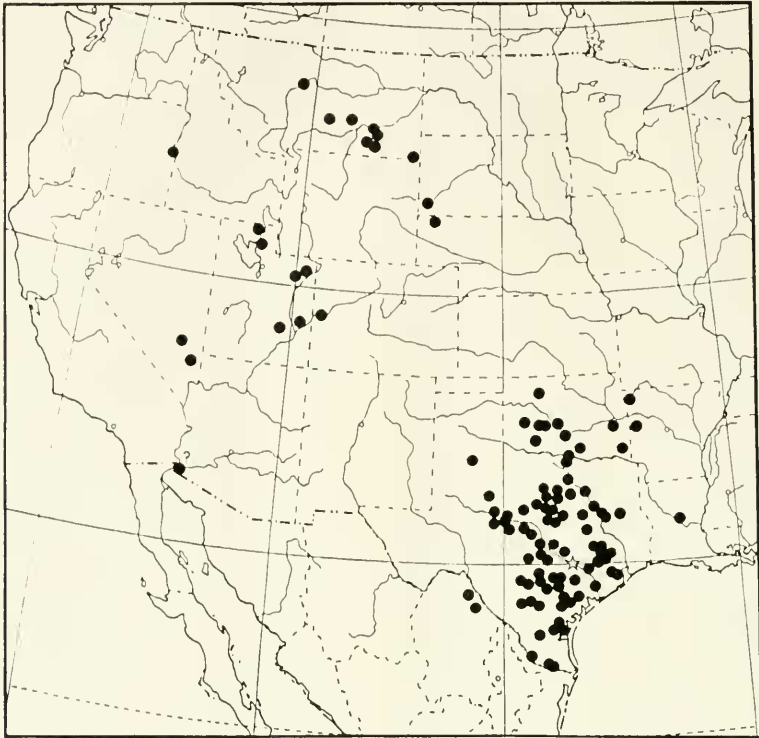


Fig. 8. Distribution of *Stenelmis occidentalis*. Star represents type locality. Arizona record is questionable; see section on distribution.

E. Hafernik (2 TAMU). *Wilson Co.* Cibolo Cr., 8 May 1980, JRD (34 HPB). *Zapata Co.* Falcon St. Pk., 11 Jun 1975, light trap, R. Turnbow (7 UGAM). Falcon St. Rec. Area, 5 Jun 1983, light trap, CBB & D. A. Rider (25 LSUC; 47 CBB; 16 KLS). **Utah.** *Box Elder Co.* 5 Oct 1971, D. W. Shaw (1 HPB), 5 Jul 1972, R. Newell (2 HPB). Deep Cr., 3 Jan 1971, D. W. Shaw (2 HPB). Fielding, Malad R., 14 Aug 1954, A. Gaufin (4 HPB). *Cache Co.* Logan, 24 Jul 1974, G. F. Knowlton (1 USUC). *Duchesne Co.* Ft. Duchesne, Uinta R., 31 Mar 1973, 5 Oct 1974, B. P. Stark (14 HPB). *Grand Co.* Arches Nat. Mon., Moab, 12 Jul 1964, J. T. Doyen (1 HPB). *Uintah Co.* Uinta R., Hwy 40, 23 May 1974, B. P. Stark (2 HPB). Ashley Cr. nr Vernal, 1 Apr 1973, 5350 ft, B. P. Stark (7 HPB). *Wayne Co.* 14 mi S Hanksville, 25 Jul 1968, at light, H. F. Howden (1 CNCI). *Weber Co.* Ogden, 10 Aug 1960, G.

F. Knowlton (1 HPB). **Mexico.** *Coahuila* Rio San Rodrigo, E El Remolino, 26–27 May 1969, HPB (3 HPB). Villa Fuente, 26 May 1969, 19 Aug 1970, HPB (27 HPB). Zaragoza, 26 May 1969, HPB (14 HPB).

**Distribution** (Fig. 8).—*Stenelmis occidentalis* is the most common and widespread species of *Stenelmis* restricted to areas west of the Mississippi River, and one of only a few found in Mexico. It is also the only species known to occur in the northwestern U.S. (MT, OR, UT), an area formerly believed to be devoid of the genus. Although there are large areas in its range from which we have not seen specimens, we suspect a lack of comprehensive collecting is the cause of its apparent absence. Two specimens from Yuma, Arizona were found in the Horn-LeConte Collection, MCZC. Since these venerable beetles have never been mentioned in the literature, and we are unaware

of any other records from Arizona, their label data may be questionable, but not impossible.

**Habitat.**—Adults occur in several types of lotic situations and on a variety of substrates. In southeastern Montana, a population of adults was found on rocks in Rosebud Cr., a shallow, very warm, five-foot wide ditched creek, with minimal flow; the creek supported a massive algal population and the beetles were covered with algae. Further downstream aggregations of 10–20 individuals were found in depressions on rocks, just above the anaerobic stain on the rocks. In contrast, adults were also found in the shallow, turbid, 30-foot wide Musselshell R. where they occurred in aggregations on large rocks in fast current near the shore. Others were collected from woody debris and overhanging shoreline vegetation in the Tongue R., a deep, turbid, 50-foot wide river. In southern Nevada, adults were found in a small stream and spring outfall. The water was clear and warm, and there was a moderate to fast current with a sand-gravel-rock substrate; filamentous algae, woody debris, and travertine were abundant. In Texas and Oklahoma, *S. occidentalis* was most commonly collected from rocks and submerged wood in sandy streams. The type series was collected at a light trap. Newly emerged adults are readily attracted to lights.

**Etymology.**—Named after its widespread, western distributional pattern.

#### ACKNOWLEDGMENTS

We extend our gratitude to William L. Hilsenhoff for his invaluable assistance and editorship, and Paul J. Spangler for reviewing and improving the manuscript. For providing beetles to study, we are grateful for the cooperation by the people and their institutions mentioned in the methods section, including James A. Gore for sending voucher specimens collected during his studies. Additional habitat information was affably furnished by Cheryl B. Barr, Daniel L. Gustaf-

son, and William D. Shepard. Also, we thank Daniel K. Young for his support, and both he and Paul J. Johnson for their interest in this research. Melissa J. Curtis provided copious assistance with the SEM. Support was provided by the Graduate School and the College of Agriculture and Life Sciences, University of Wisconsin, and by the Theodore Roosevelt Memorial Fund, American Museum of Natural History, New York.

#### LITERATURE CITED

- Barr, C. B. and J. B. Chapin. 1988. The aquatic Dryopoidea of Louisiana (Coleoptera: Psephenidae, Dryopidae, Elmidae). *Tulane Stud. Zool. Bot.* 26: 89–164.
- Brown, H. P. 1972. Biota of freshwater ecosystems identification manual no. 6. Aquatic dryopoid beetles (Coleoptera) of the United States. Water Pollution Control Research Series, U.S. Environ. Prot. Agency, Washington, D.C. 92 pp.
- . 1983. A catalog of the Coleoptera of America north of Mexico, family: Elmidae. U.S. Dep. Agric., Agric. Handb. No. 529-50. 33 pp.
- . 1987. *Stenelmis cheryl*: new name for a well-known riffle beetle (Coleoptera: Elmidae). *Entomol. News* 98: 111–112.
- Burke, H. R. 1963. Notes on Texas riffle beetles (Coleoptera, Elmidae). *Southwest. Nat.* 8: 111–114.
- Gore, J. A. 1975. Fall-winter composition of the benthic macroinvertebrates of the Tongue River, Montana. *Proc. Fort. Union Coal Field Symp.* 2: 212–225.
- . 1977. Reservoir manipulations and benthic macroinvertebrates in a prairie river. *Hydrobiologia* 55: 113–123.
- . 1978. A technique for predicting in-stream flow requirements of benthic macroinvertebrates. *Freshwater Biol.* 8: 141–151.
- Poole, W. C. and K. W. Stewart. 1976. The vertical distribution of macrobenthos within the substratum of the Brazos River, Texas. *Hydrobiologia* 50: 151–160.
- Sanderson, M. W. 1938. A monographic revision of the North American species of *Stenelmis* (Dryopidae: Coleoptera). *Univ. Kans. Sci. Bull.* 25: 635–717.
- Stewart, K. W., G. P. Friday, and R. E. Rhame. 1973. Food habits of hellgrammite larvae, *Corydalus cornutus* (Megaloptera: Corydalidae), in the Brazos River, Texas. *Ann. Entomol. Soc. Am.* 66: 959–963.
- White, D. S. 1982. *Stenelmis morsei*, a new species of riffle beetle (Coleoptera: Dryopoidea: Elmidae) from South Carolina. *Coleopt. Bull.* 36: 170–174.